Winlink, Digital Voice and Tech Based Comms - When Infrastructure Fails

WINLINK
Global Radio Email SM

WHEN INFRASTRUCTURE FAILS

WHEN INFRASTRUCTURE FAILS

Amateur Radio disaster communicators pride themselves on being able to communicate “When All Else Fails.” This assertion is based largely on the fact that Amateur Radio does not rely on normal infrastructure to operate, so it can continue to operate during a disaster. However, in recent years many Amateur Radio systems have begun taking advantage of infrastructure to add features and functions. Often, repeaters are linked together by the Internet. Digital messaging relies on access to servers on the Internet or other networks. Even programming radios may require access to networked systems. This session will provide an understanding of what infrastructure our Amateur communication systems may be using, and what options we have when that infrastructure fails.

WHEN INFRASTRUCTURE FAILS

infrastructure

- *n.*
- The basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water and power lines, and public institutions including schools, post offices, and prisons.

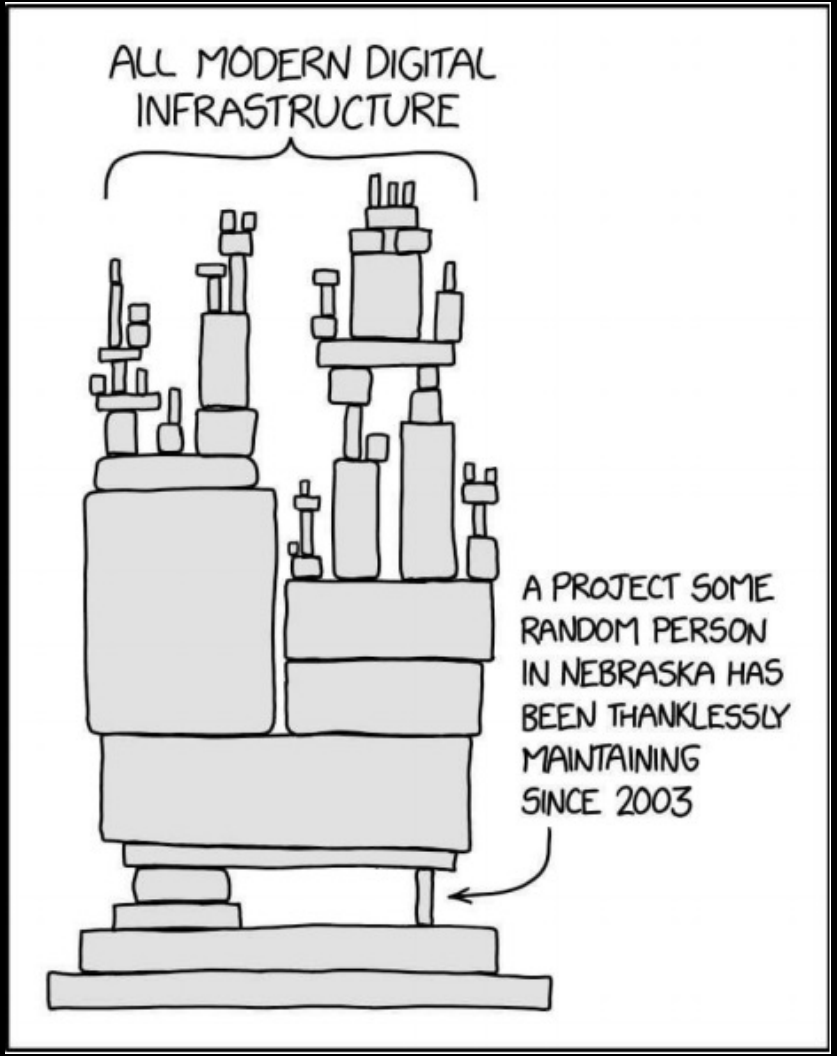
WHEN INFRASTRUCTURE FAILS

infrastructure

There's only one reason to choose a wireless company.
IT'S THE NETWORK™
verizon wireless

WHEN INFRASTRUCTURE FAILS

infrastructure


ALL MODERN DIGITAL INFRASTRUCTURE
A PROJECT SOME RANDOM PERSON IN NEBRASKA HAS BEEN THANKLESSLY MAINTAINING SINCE 2003

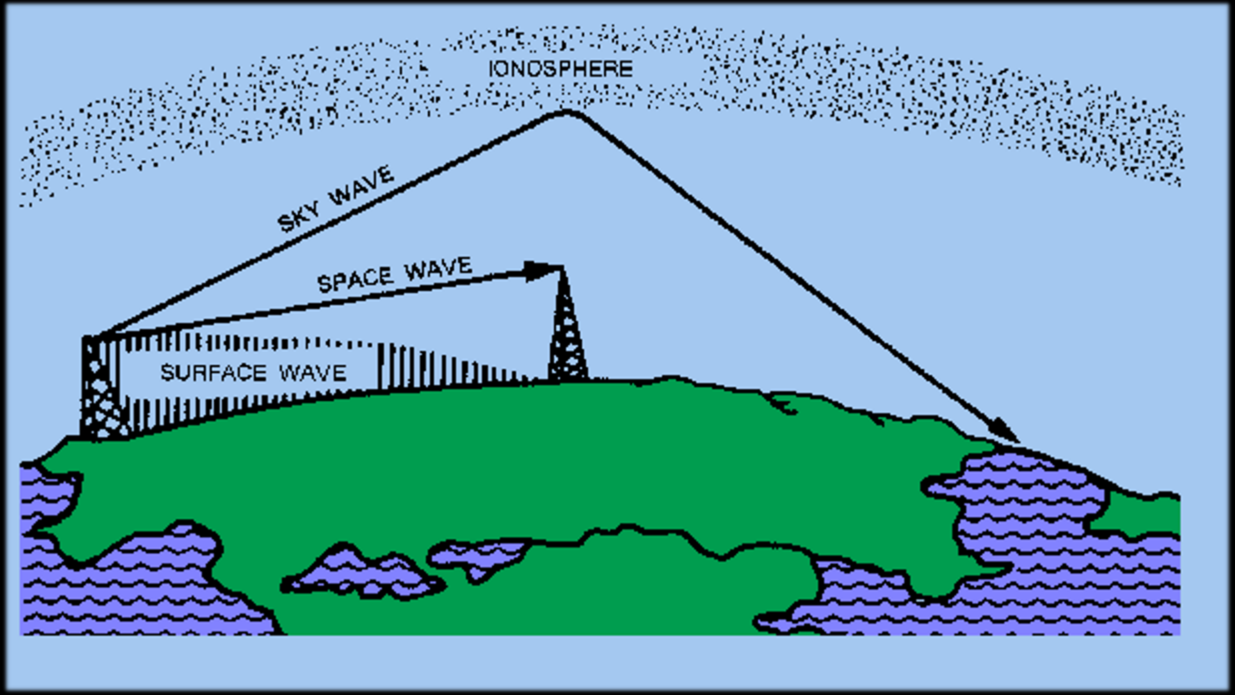
Can

We

Talk?

CAN WE TALK?

HF Operations:
Need Power and
Big antennas

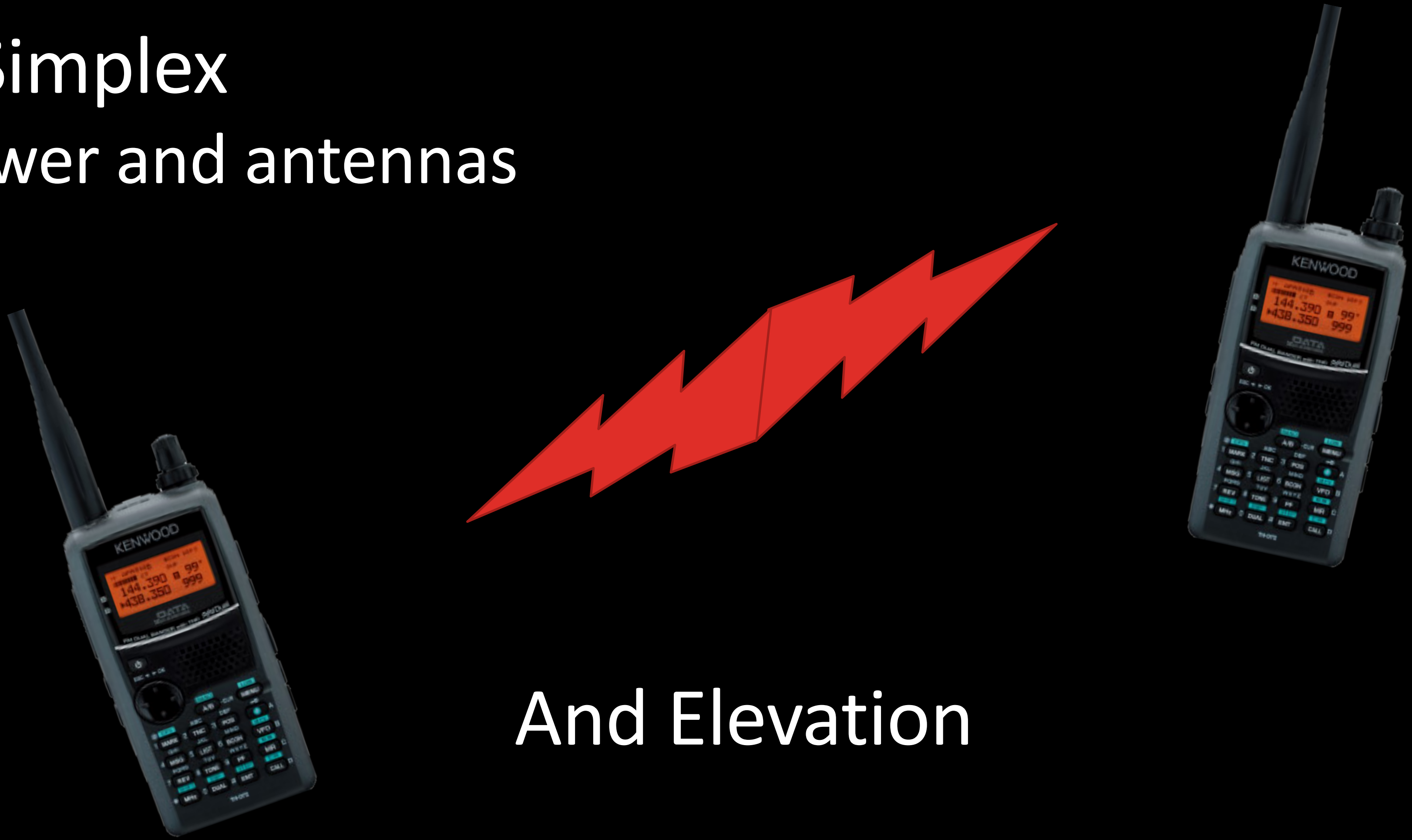


And Propagation

CAN WE TALK?

V/UHF Simplex

Need power and antennas



And Elevation

But What If We Rely On A *Repeater?*

CAN WE TALK?

V/UHF Repeater Operation

Need power and antennas

And a working repeater!

CAN WE TALK?

Does your repeater have:

- Backup batteries?
- A Backup Generator?

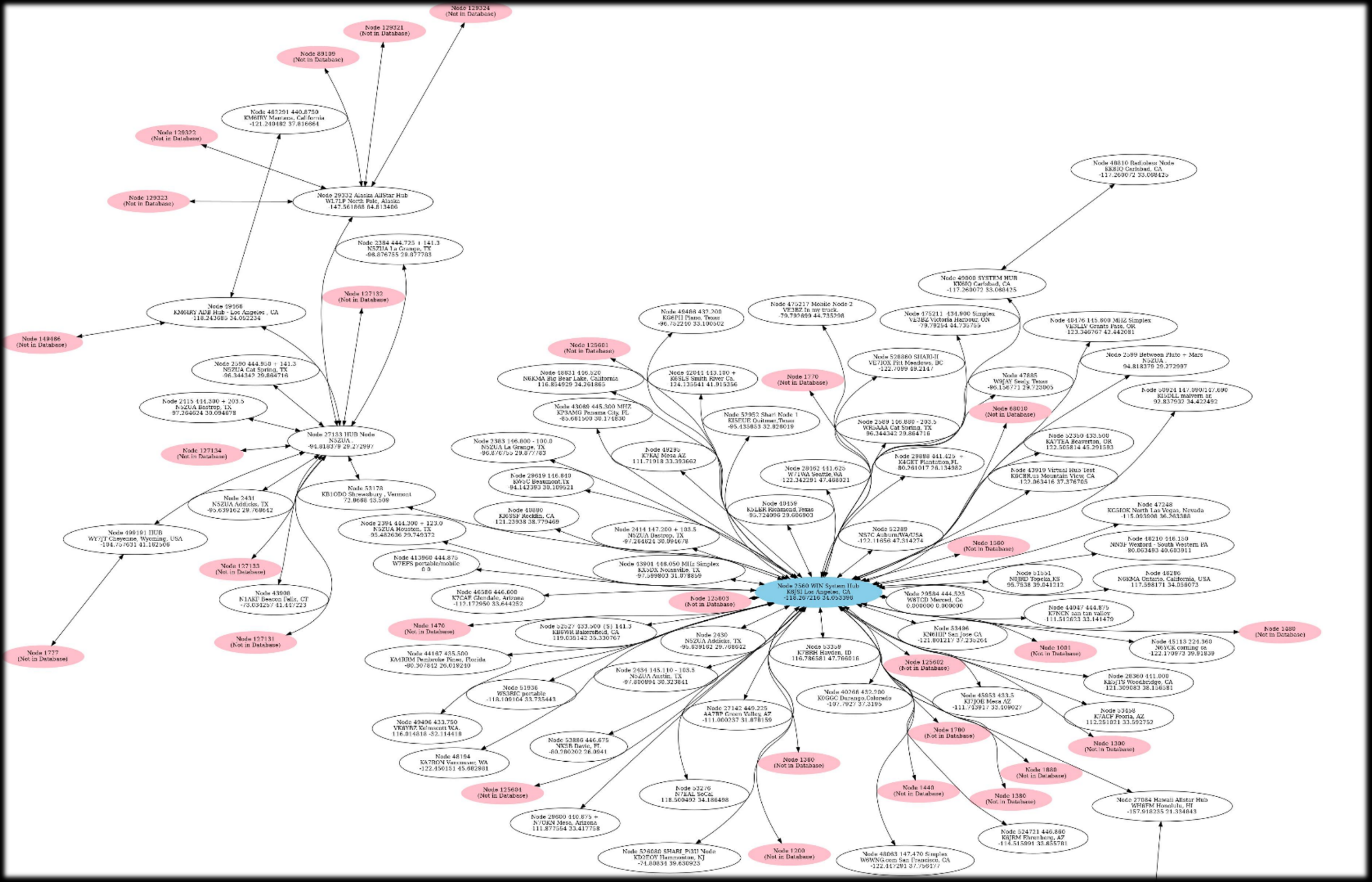
Is it “hardened” against know hazards

- Floods
- Earthquakes
- Fire

Do you conduct exercises that simulate repeater failure?

Is Your Repeater Part Of A Bigger ***Network?***

CAN WE TALK?



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Node 129321 (Not in Database)
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Node 129322 (Not in Database)
Node 129323 (Not in Database)
Node 29332 Alaska AllStar Hub WL7LP North Pole, Alaska -147.561868 84.813406
Node 2384 444.725 + 141.3 N5ZUA La Grange, TX -96.876755 29.877783
Node 127132 (Not in Database)
Node 49168 KM6IRY ADB Hub - Los Angeles , CA -118.243685 34.052234
Node 149486 (Not in Database)
Node 2590 444.950 + 141.3 N5ZUA Cat Spring, TX -96.344342 29.864716
Node 2415 444.300 + 203.5 N5ZUA Bastrop, TX -97.264624 30.094678
Node 27133 HUB Node N5ZUA . -94.818379 29.272997
Node 127134 (Not in Database)
Node 53178 KB1ODO Shrewsbury , Vermont 72.8688 43.509
Node 2431 N5ZUA Addicks, TX -95.639162 29.768642
Node 498191 HUB WY7JT Cheyenne, Wyoming, USA -104.757631 41.162506
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Node 43908 N1AKF Beacon Falls, CT -73.034257 41.447223
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Node 48810 Radioless Node KK6IQ Carlsbad, CA -117.260072 33.068425
Node 49800 SYSTEM HUB KK6IQ Carlsbad, CA -117.260072 33.068425
Node 475217 Mobile Node 2 VE3BZ In my truck. -79.792899 44.735298
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Node 475211 434.900 Simplex VE3BZ Victoria Harbour, ON -79.79254 44.736765
Node 48476 145.800 MHZ Simplex VE3LLV Grants Pass, OR -123.346767 42.442081
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Node 50924 147.090/147.690 KI5DLL malvern ar, 92.837932 34.422492
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Node 52952 Shari Node 1 KI5EUR Quitman,Texas -95.435853 32.828019
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Node 2383 146.800 - 100.0 N5ZUA La Grange, TX -96.876755 29.877783
Node 49295 K7KAJ Mesa AZ 111.71918 33.393662
Node 29888 441.425 + K4GET Plantation,FL 80.261017 26.134982
Node 52350 433.500 KA7TEA Beaverton, OR 122.505814 45.291593
Node 28462 441.625 W7IWA Seattle,WA -122.342291 47.468021
Node 43919 Virtual Hub Test K6CBR.us Mountain View, CA -122.063416 37.376705
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Node 48880 KI6SSF Rocklin, CA 121.23938 38.779469
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Node 47248 KC5IOK North Las Vegas, Nevada -115.093908 36.263388
Node 2394 444.300 + 123.0 N5ZUA Houston, TX -95.482636 29.749372
Node 2414 147.200 + 103.5 N5ZUA Bastrop, TX -97.264624 30.094678
Node 52289 NS7C Auburn/WA/USA -122.11656 47.314274
Node 1560 (Not in Database)
Node 48210 446.150 NN3F Wexford - South Western PA -80.063493 40.603911
Node 413960 444.875 W7EFS portable/mobile 0 0
Node 43901 448.050 MHz Simplex KX5DX Nolanville, TX -97.599803 31.078859
Node 51551 N0JRD Topeka,KS 95.7538 39.041212
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Node 52527 433.500 (S) 141.3 KB6WR Bakersfield, CA 119.035142 35.330767
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Node 1480 (Not in Database)
Node 53359 K7BRH Hayden, ID 116.786581 47.766016
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Node 45113 224.360 N6YCK corning ca -122.170973 39.91839
Node 44167 435.500 KA4RRM Pembroke Pines, Florida -80.307842 26.019240
Node 125602 (Not in Database)
Node 2434 145.110 - 103.5 N5ZUA Austin, TX -97.800894 30.323841
Node 28360 441.000 KE6JTS Woodbridge, CA -121.309083 38.156581
Node 51936 WS3RIC portable -118.109104 33.735443
Node 40268 432.200 K0GGC Durango,Colorado -107.7927 37.3195
Node 45953 433.5 KI7JOE Mesa AZ -111.743917 33.409027
Node 53458 K7ACF Peoria, AZ 112.251021 33.592752
Node 49496 433.750 VK6YBZ Kelmscott WA. 116.014818 -32.114418
Node 27142 449.225 AA7BP Green Valley, AZ -111.000237 31.878159
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Node 48194 KA7RON Vancouver, WA -122.450151 45.682981
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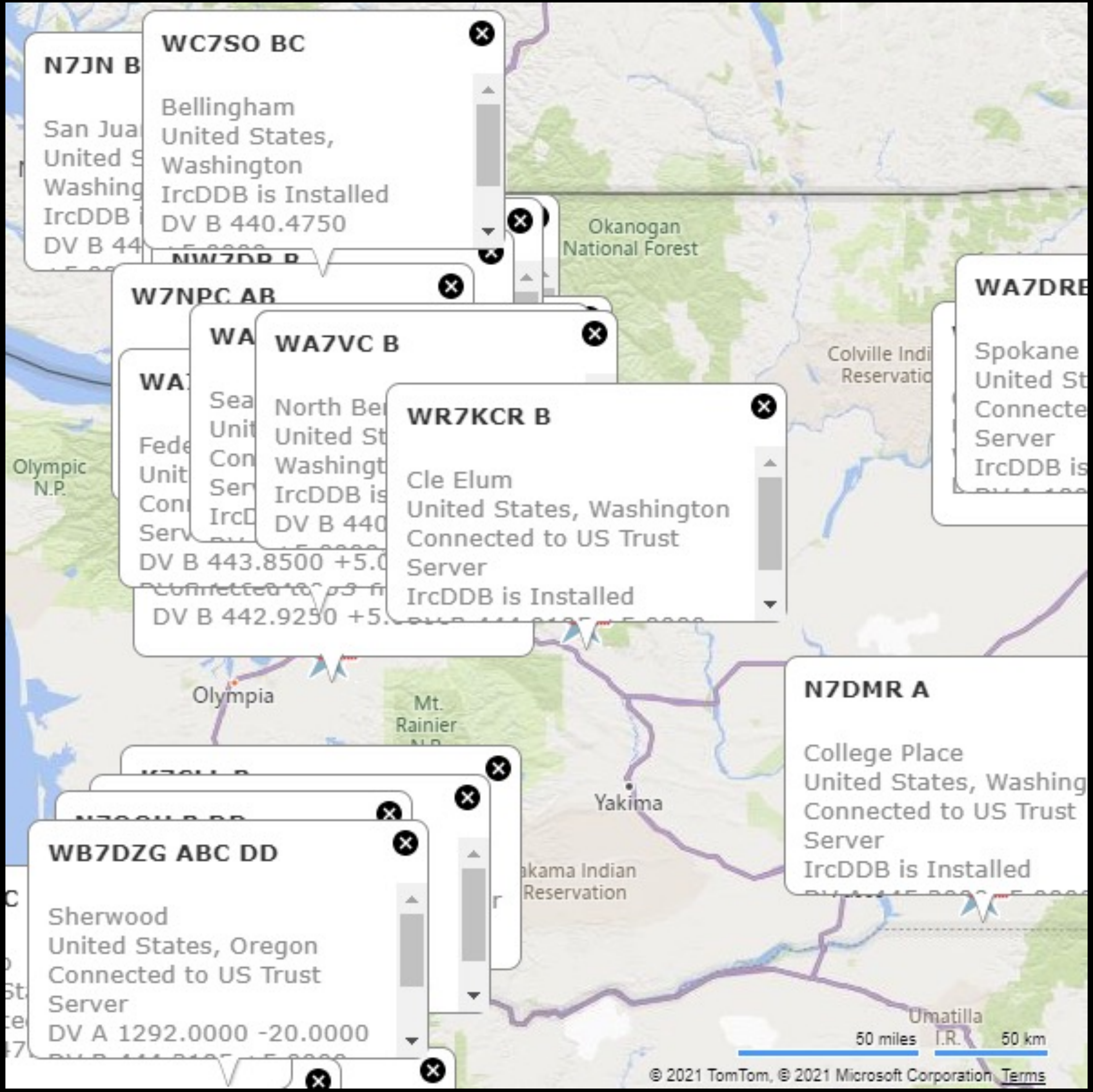
Node 27084 Hawaii Allstar Hub WH6FM Honolulu, HI -157.918235 21.334843
Node 29600 440.875 + N7OKN Mesa, Arizona 111.877554 33.417758
Node 524721 446.860 K6JRM Ehrenberg, AZ -114.515991 33.855781
Node 526080 SHARI_Pi3U Node KD2EOY Hammonton, NJ -74.80834 39.630923
Node 1200 (Not in Database)
Node 48063 147.470 Simplex W6WNG.com San Francisco, CA -122.447291 37.756477

KENWOOD
144.390
438.350

CAN WE TALK?

The D-Star Network and System Fusion use the Internet



WC7SO BC

Bellingham
United States, Washington
IrcDDB is Installed
DV B 440.4750

WR7KCR B

Cle Elum
United States, Washington
Connected to US Trust Server
IrcDDB is Installed

N7DMR A

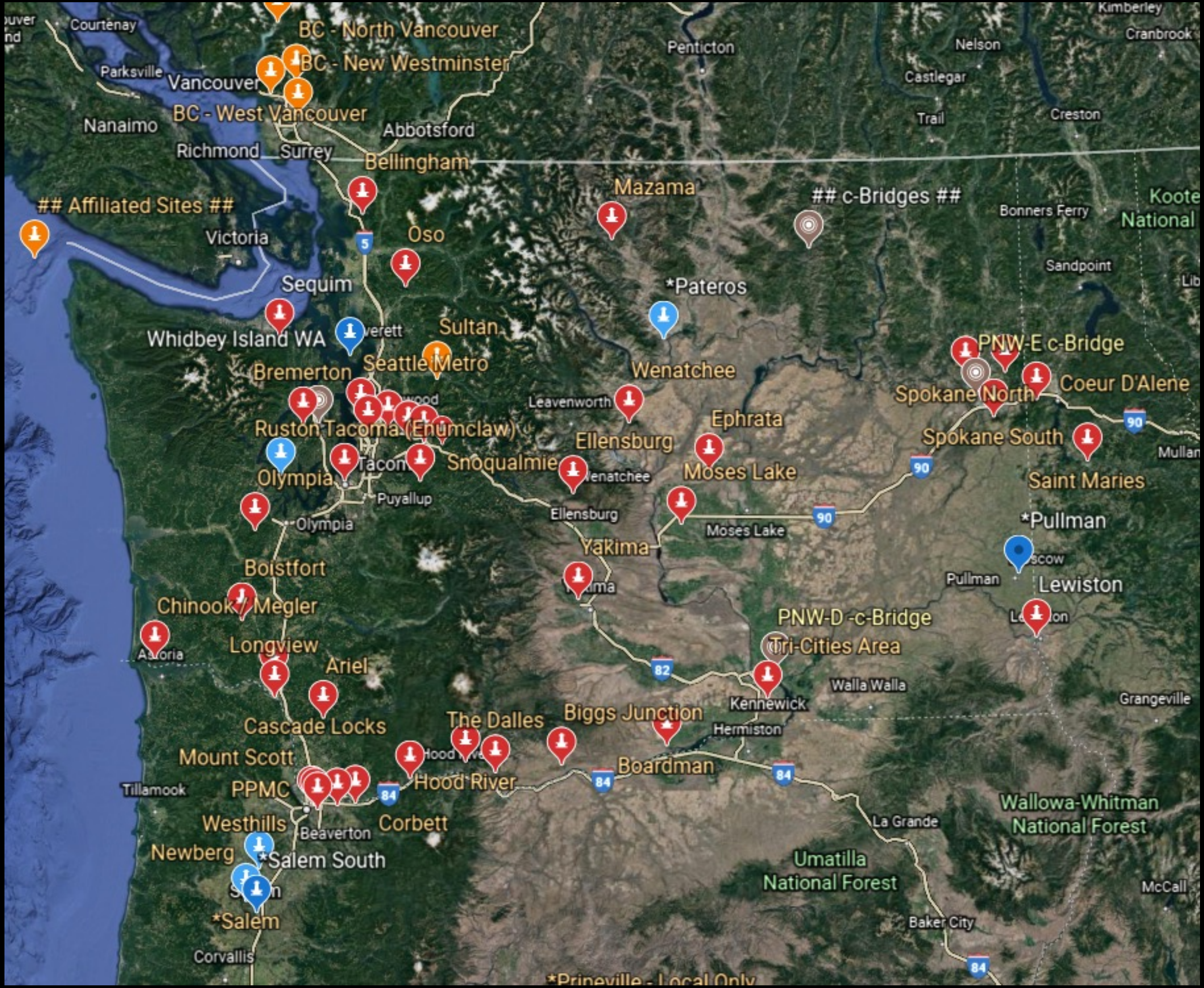
College Place
United States, Washing
Connected to US Trust Server
IrcDDB is Installed

WB7DZG ABC DD

Sherwood
United States, Oregon
Connected to US Trust Server
DV A 1292.0000 -20.0000

CAN WE TALK?

DMR in the PNW
uses a hybrid Network



There Is Nothing Wrong

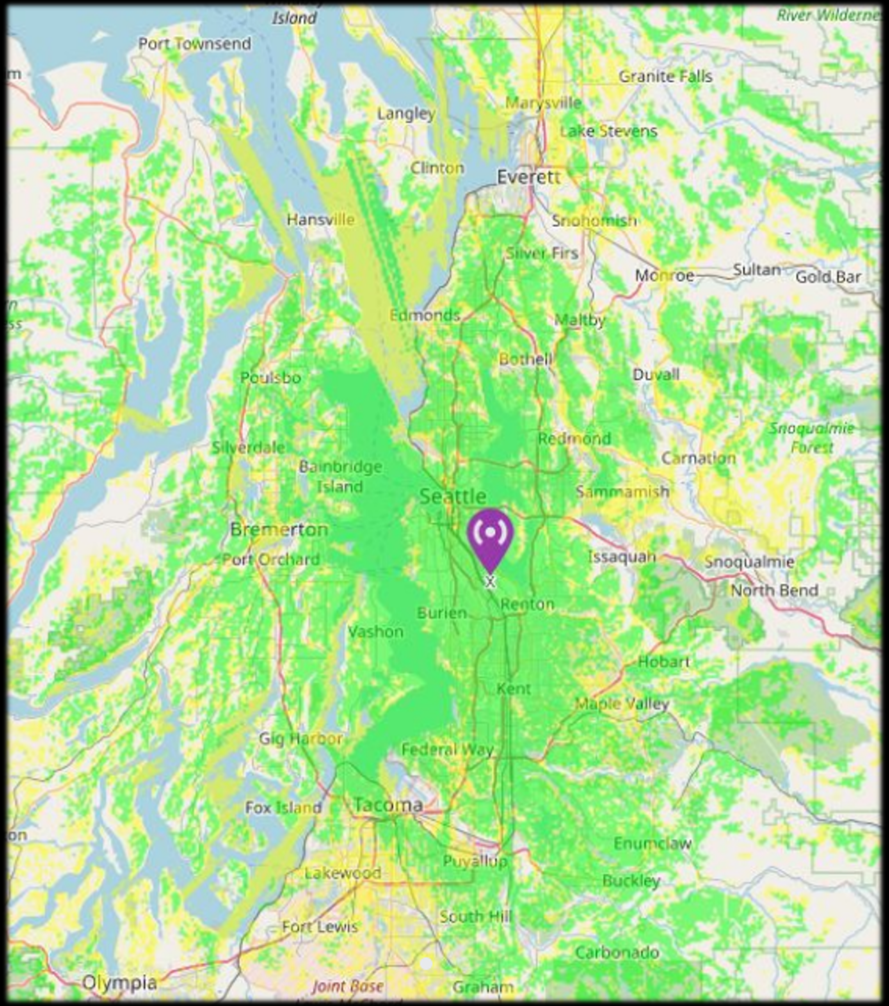
With Using These

Resources When ***Available***

WE CAN TALK!

It takes planning

- Analyze your local hazards and how they could impact your operations
- Understand the failure modes of your resources
- Develop plans to mitigate infrastructure failures
- Document your plans
- Train your teams to recognize failures
- Exercise your plans simulating failures

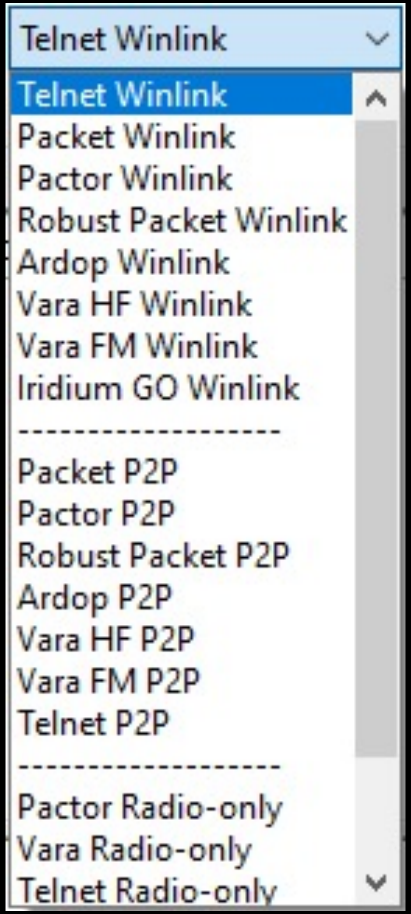


WINLINK

- Worldwide system for sending e-mail via radio.
- Provides e-mail from almost anywhere in the world.
- Entirely supported and operated by amateur radio volunteers (Amateur Radio Safety Foundation, Inc.).
- Winlink Express software is the preferred client application.
- Adopted for contingency communication by many government agencies.
- Used by infrastructure-critical NGOs such as International & American Red Cross, Southern Baptist Disaster Relief, DHS Tiered AT&T Disaster Response & Recovery, FedEx, Bridgestone Emergency Response Team, etc.

WINLINK CONNECTIONS

- **HF Modes**
  - Pactor
  - Robust Packet
  - ARDOP
  - Vara HF
- **V/UHF FM Modes**
  - Packet
  - Vara FM
- All modes can be Winlink (gateway) or Peer-to-Peer (P2P)



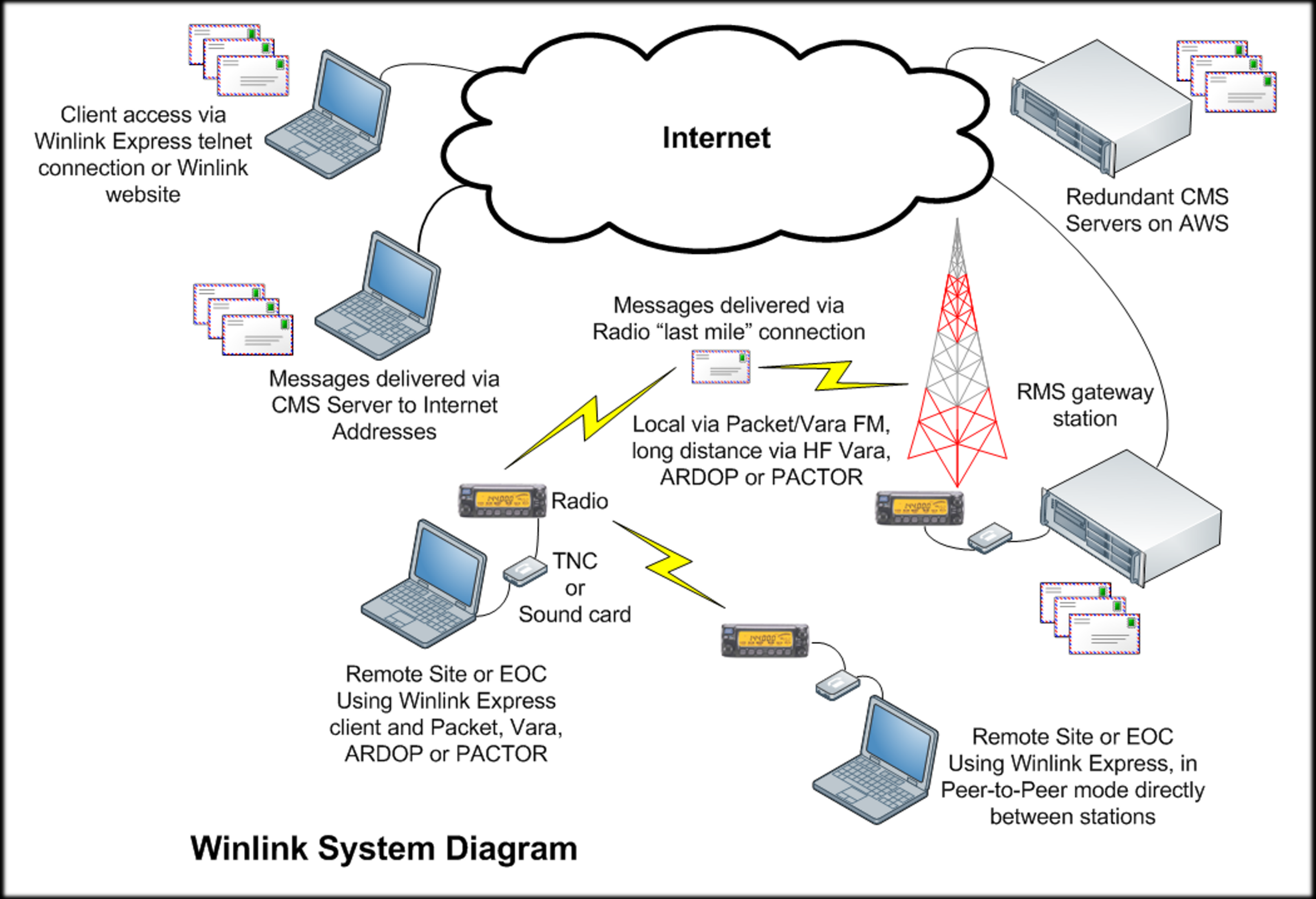
Most Winlink Modes

Use Some Sort

Of Network

WINLINK NETWORK DIAGRAM

Gateway Stations make use of the Internet and Cloud Servers


Internet
Client access via Winlink Express telnet connection or Winlink website
Redundant CMS Servers on AWS
Messages delivered via CMS Server to Internet Addresses
Messages delivered via Radio “last mile” connection
Local via Packet/Vara FM, long distance via HF Vara, ARDOP or PACTOR
RMS gateway station
Radio
TNC or Sound card
Remote Site or EOC Using Winlink Express client and Packet, Vara, ARDOP or PACTOR
Remote Site or EOC Using Winlink Express, in Peer-to-Peer mode directly between stations

Winlink System Diagram

WINLINK GATEWAYS

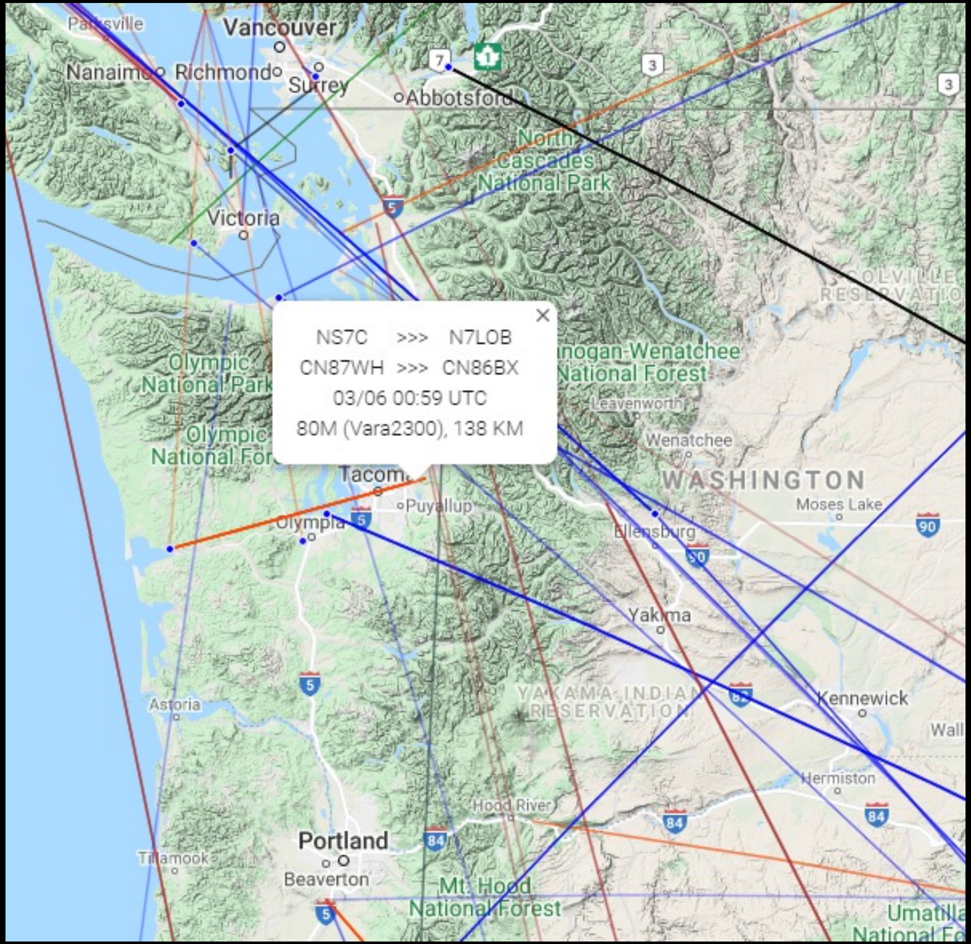
Local gateway stations will need to survive the disaster to be of use

- Are there Backup batteries?
- A Backup Generator?
- Hardened Internet connection?
- Securely mounted?
- Secure from tampering?

WINLINK GATEWAYS

If local gateways are not operational, consider HF gateways

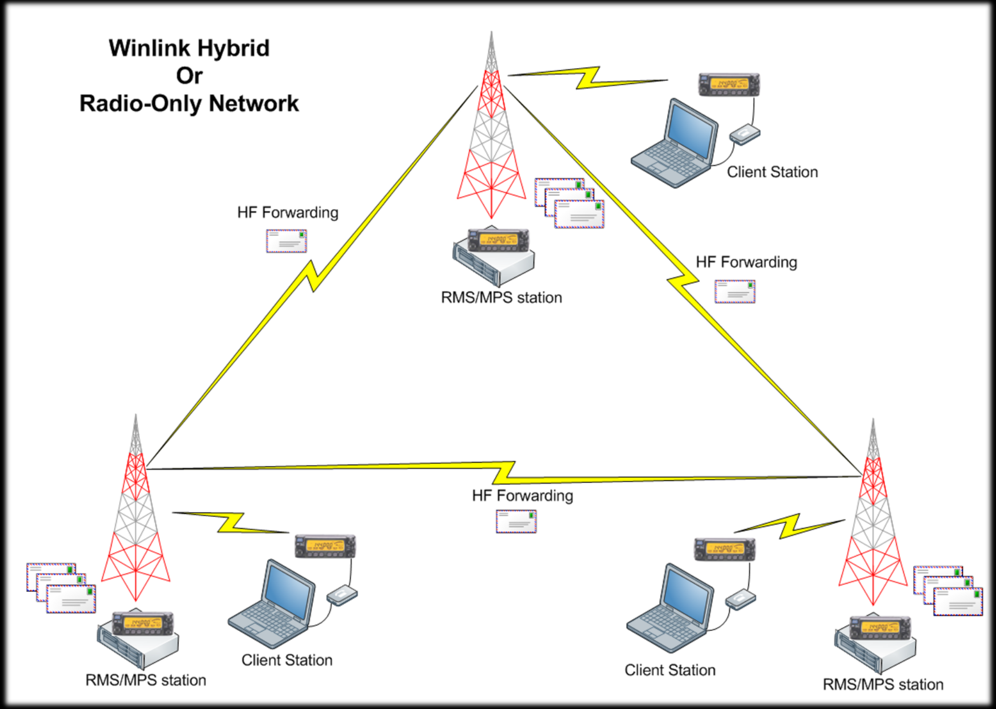
- Regional/State gateways (80/40M)
- Long distance gateways (40/20M)
- NVIS Antennas
- Pactor, Vara HF, ARDOP
- Keep messages short



RMS RELAY

RMS Relay provides several backup configurations for when the Internet fails

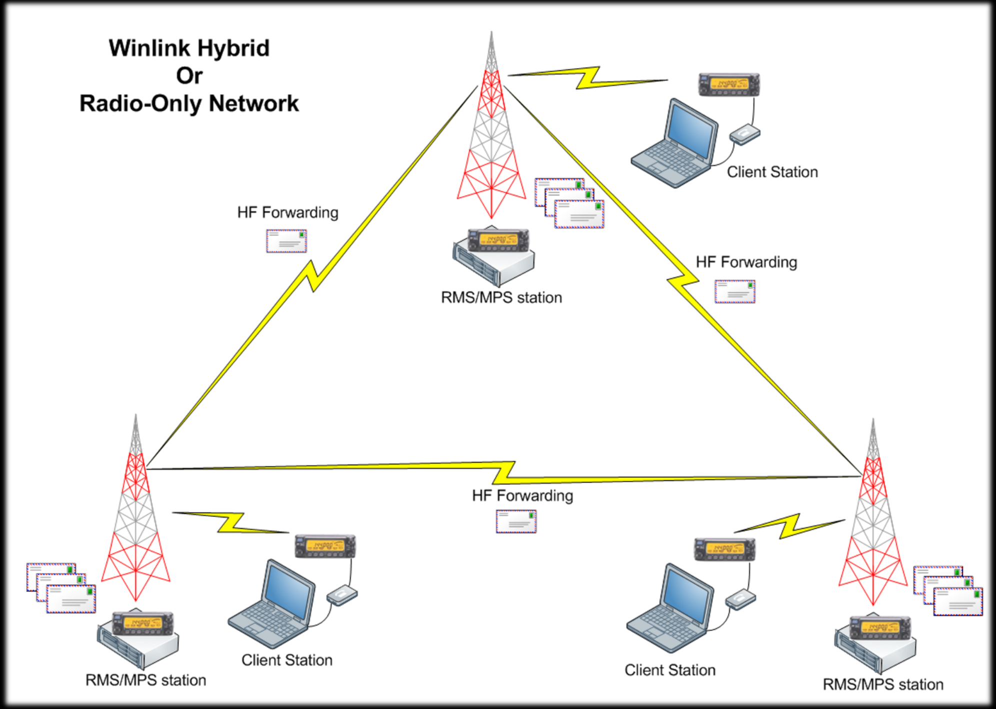
- Store and forward over HF
- Local message server, RF or Telnet
- Hybrid or Radio-Only networks
- Forwarding over Pactor Vara HF
- Supports Message Pickup Stations (MPS)



RMS RELAY

Disadvantages to RMS Relay Radio-Only networks

- Message delivery many take hours
- Radio-Only must go through MPS
- Cannot send to Internet addresses
- Clients must set up their MPS
- Difficult to setup and deploy in a disaster

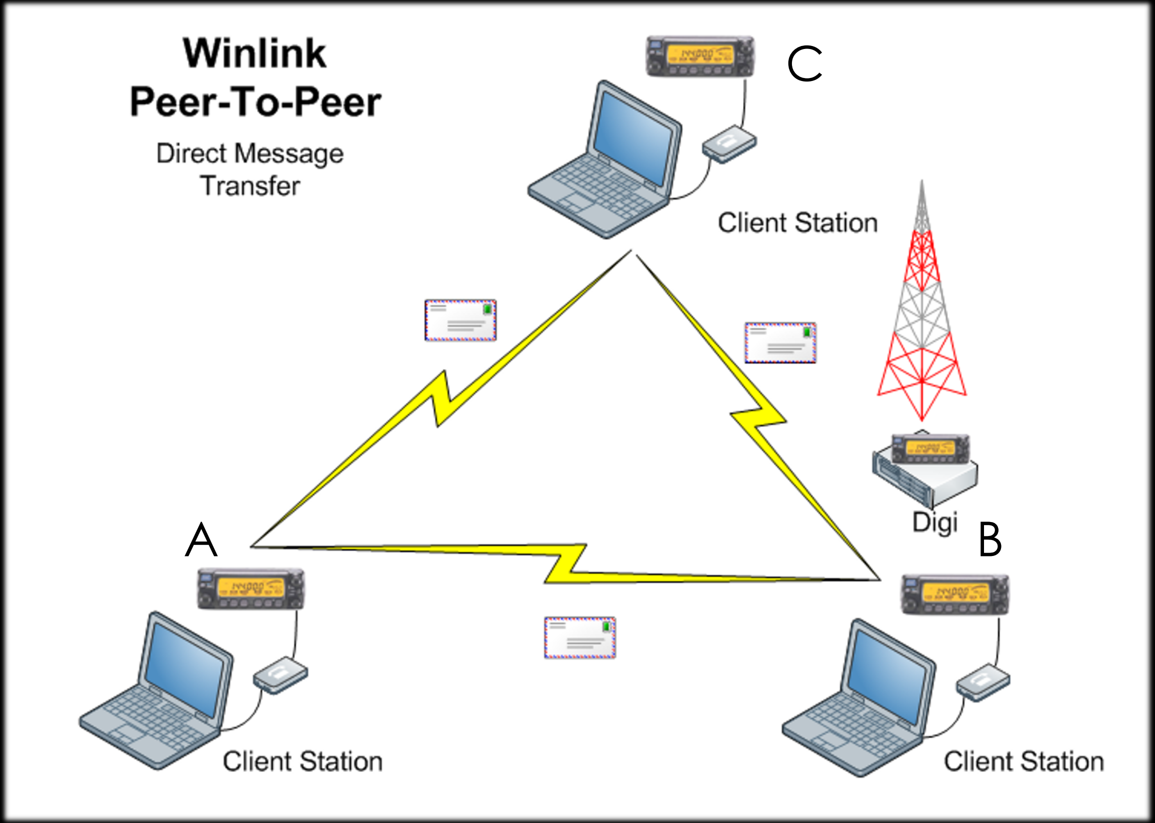


PEER-TO-PEER

Winlink Provides a Powerful Connection tool

"When All Else Fails"

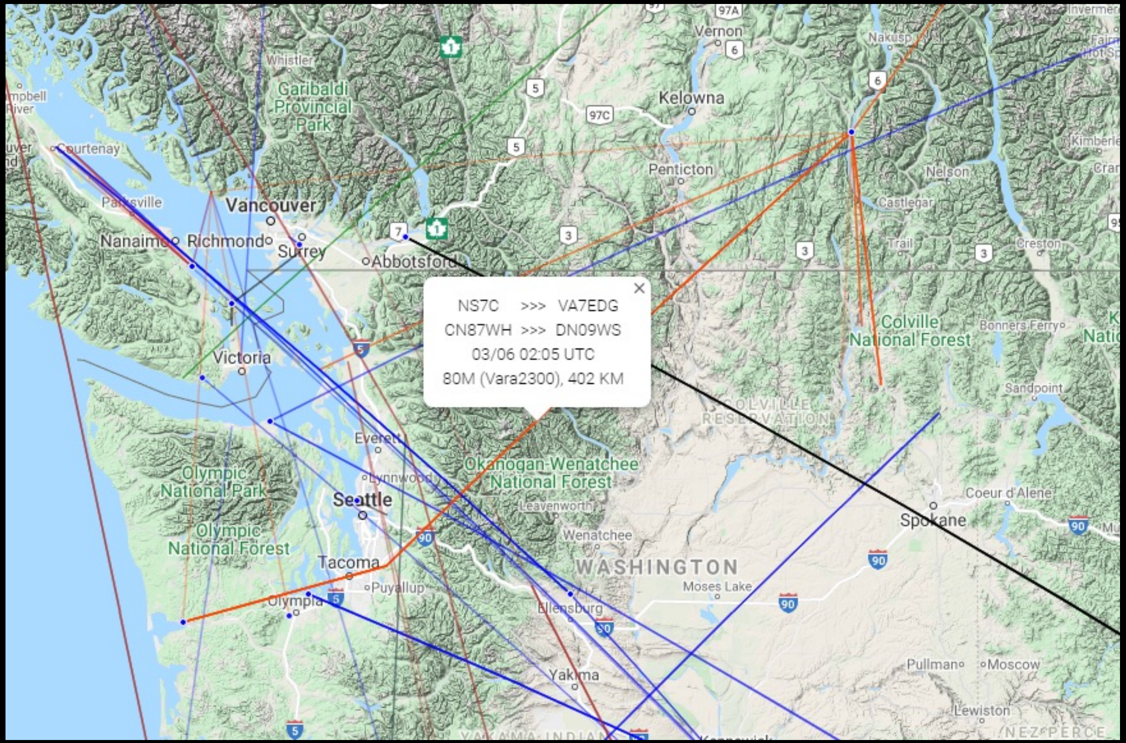
- No Internet involved
- Direct between client stations
- Can be over HF or V/UHF
- Messages must be type P2P
- Must connect to the addressed station
- Digipeaters can extend the V/UHF range



PEER-TO-PEER

Manual Forwarding Using P2P

- Client creates P2P message
- Message is sent to intermediate
- Intermediate forwards “without change” to destination station
- Message could be forwarded to a gateway station if needed

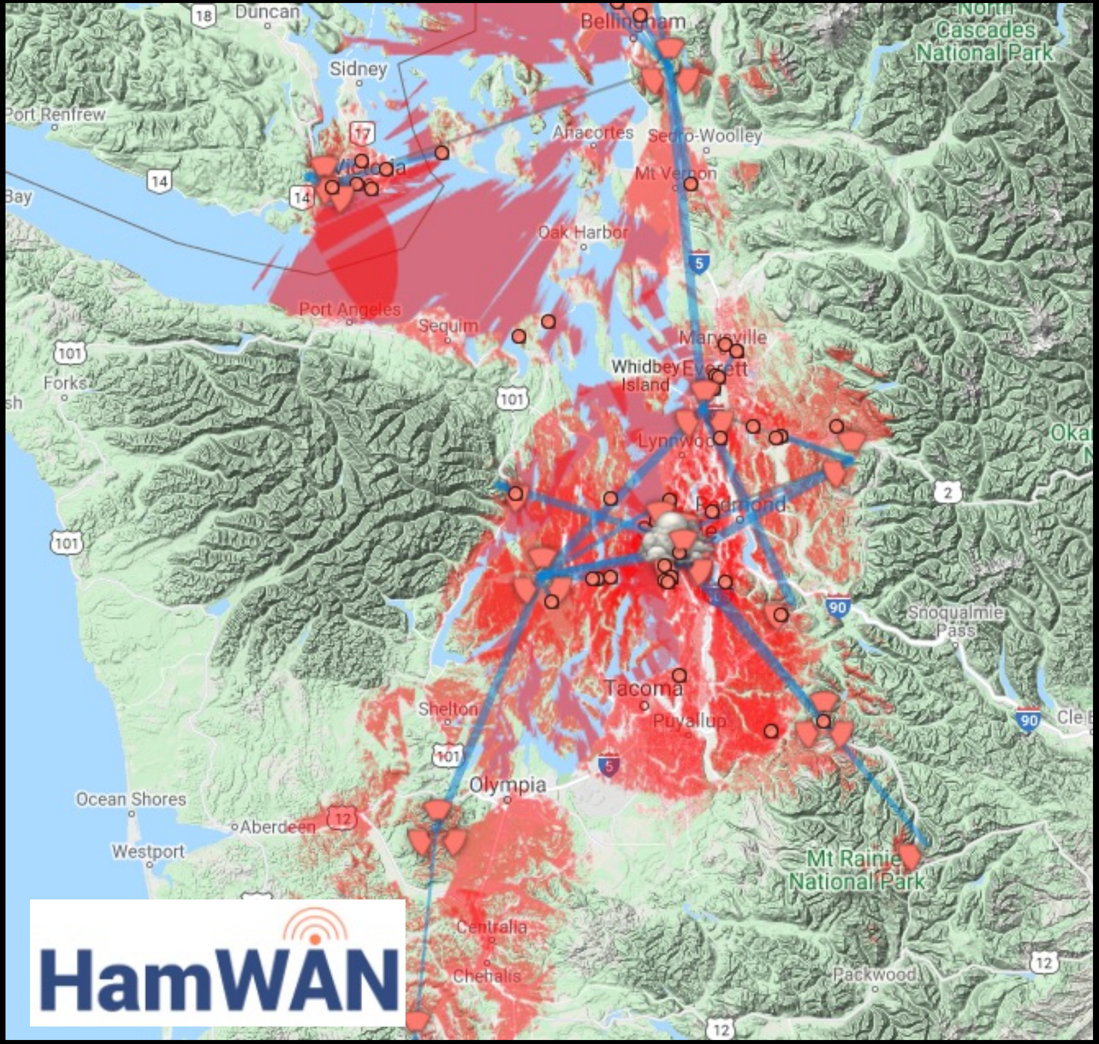


Winlink Can Make Use Of Alternate IP Networks

OTHER IP NETWORKS

Using mesh and other IP networks

- ARDEN, HamWAN, etc.
- Uses Telnet sessions
- Can also support remote RMS Relay server



CONCLUSION

HAM RADIO SYSTEMS ARE NOT EXEMPT FROM INFRASTRUCTURE FAILURES

LEARN TO RECOGNIZE FAILURES AND CREATE SOLUTIONS TO MITIGATE THEIR IMPACT

DOCUMENT, TRAIN, AND EXERCISE YOUR PLANS

COMMUNICATION CAN CONTINUE "WHEN ALL ELSE FAILS"

CONTACT

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